

WQB "Wide Aperture Quad" for Main Injector

14 May 2004

IB2 conference room

9:00 AM

Attendees: Leon Bartelson, Bruce Brown, John Carson, Weiren Chou, TJ Gardner, Dave Harding, Dave Johnson, Vladimir Kashikhin, Gregg Kobliska, Lucy Nobrega, François Ostiguy, John Zweibohmer

Vladimir presented a seven-turn version of the LQB. The pole tip radius is 55 mm. The outside dimension of a lamination is 340 mm, so the width and height of the magnet would be a little over 680 mm, about 27.5 in. The good field region is larger than on the 6-turn model. The field does saturate at high current, but is certainly tolerable. Vladimir showed some initial 3-D end field calculations based on a simple chamfer, with the saturation behaving in a manner very similar to the body. He advocates incorporating a removable end pack to allow trimming the length of the magnet to match the existing quadrupoles. He would like to see measurements of the body field of the existing quads to give a sense of the end field contribution the integral.

The consensus was that the 7-turn design was worth the extra cost and effort. Vladimir says that eight turns will not work, due to overwhelming saturation. A new beam tube is needed to take advantage of the extra aperture. That could be a long lead time item, so we need to get started on it. The method of beam tube installation interacts with the decision on whether to weld or bolt the magnet together. With a longer water path and more resistance, we need to recalculate the temperature rise in the conductor. The larger aperture and more turns will change the inductance of the main coil and the trim coil, as well as their mutual inductance. There may be a change in the optimum number of windings in the trim coil. We need to check the impact of cutting a chamfer in the coil region of the end plate to allow the coils to start bending before exiting the yoke.

There was much discussion of the ends and how long the magnet could be. The flange-to-flange distance should not change. Close attention needs to be paid to ensure that the appropriate clamp can be installed. End details need to be settled at some level so that the total length of the magnet can be solidified. Without that, the pole geometry remains uncertain.

The transition to the Lambertson magnets will not be very smooth, regardless of what we do. A BPM expert needs to be consulted on whether new BPM's are needed or whether the aperture of the existing BPM's is sufficient.

Goals for the next meeting:

- Lamination drawing
- Beam tube drawing (cross section)
- Water cooling calculations
- End chamfer for coil calculation
- Inductance calculation
- Measurement plan for existing magnets

Next meeting in two weeks: Thursday, 27 May 2004. Same time, same place.